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Development of a Methodology for Evaluating the Economic Impact of Rural Public Transportation in Georgia Counties

Final Report

Research Project 9307

Georgia Department of Transportation
Office of Materials and Research

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1.0 INTRODUCTION

Investment in transportation infrastructure and services is undertaken for many reasons. Perhaps the most important reason, however, is to support and enhance the economic growth of a region. Numerous studies have been undertaken of the likely economic impact of highway investment, and a smaller, but still substantial, number of studies have been undertaken on the economic impact of rail transit systems. However, very few studies have examined the economic impact of bus transit systems, and even fewer on the economic impact of rural bus systems. Yet, with the emphasis of ISTEA on better linking transportation investment to a broader perspective of a community's or region's well-being, there is an important need to have, 1) substantive knowledge on what economic impacts can be attributed to rural public transit systems, and 2) practical tools that can be used by local governments to estimate the benefits of public transportation operations.

Investment in the transportation system is a critical element of a state's strategy to enhance economic development and promote the quality of life of its citizens. There has been substantial interest in recent years in using transportation investment in rural areas to provide the necessary public services that will improve rural life. With limited resources, however, such investment decisions must be made with the best possible information on the likely benefits and costs associated with different strategies. In Georgia, where numerous transportation providers offer transit services and where fiscal constraints have caused county officials to

examine the benefits of such services, this information is especially critical.

The purpose of this research project was to develop a methodology that could be used by local officials to evaluate the economic impact of rural public transportation services in Georgia. This methodology was to be designed in a way that could be easily understood by these officials and which would rely on data and assumptions directly related to the Georgia context. This methodology was also targeted at local officials' understanding of the relationship between transit service and economic impact in the county. As it turned out, this research is one of the few research projects in the country which has focussed on rural public transportation services, not to mention the linkage with economic development.

This report is organized in six sections. The next section provides an overview of the research design and the approach toward developing the benefit and cost methodology. Section 3 is a summary of the literature review that was undertaken as part of the project. This review was very broad in scope given the initial paucity of literature on the specific topic. Section 4 presents the methodology and the underlying principles upon which it is based. Section 5 is a guide that instructs users on the steps that must be followed to use the methodology. The final section concludes the report. The appendices of the report include an extensive reference list on those books and articles that relate to the general topic of economic development and service provision, both in the transportation sector and in other areas as well.

2.0 OBJECTIVES AND RESEARCH PLAN

The objectives of this research project were as follows:

Develop a conceptual framework that helps identify the key factors that link increased public mobility in rural areas and local economic activity.

This objective provides the basic point of departure for understanding the relationships that exist between public mobility and economic activity. The framework helps identify the key factors or variables that are important in both rural public transportation and rural economies, and the cause-effect relationships between these variables. Before any methodology can be developed, one needs to know the underlying basic principles upon which that methodology must be based. Also important in this framework is a preliminary understanding of the type of data that might be necessary to implement a proposed methodology.

Investigate and assess alternative methods to calculate the economic impact of public investments, with special attention given to the multiplier effect of such investments.

There are many different ways of calculating the impact on the economy of public investments. Two of the most notable approaches, for example, are linear regression models and input-output models. This objective was aimed at finding and assessing the effectiveness of alternative methods for estimating this impact. Achieving this objective required an examination of the different types of methods used in the U.S., and the development of criteria for assessing their usefulness for the research proposed in this project.

Develop a methodology that can be used by state and local officials to calculate the economic impact of rural public transportation systems.

This was the primary objective of this research. Included in this objective was the need to

structure the method in such a way that it is usable and understandable to those who will eventually use it. The actual development of the methodology was based on an understanding of the causal relationships that exist between key variables, and the types of data that are available to local officials and practitioners.

Develop instructional materials that can be used to guide local areas on how to implement the methodology.

An important ingredient in the success of these efforts was having well-written and understandable instruction on how to use the methods. The importance of successfully disseminating the proposed methodology suggested that special efforts be undertaken to train potential users.

Test the methodology and materials to validate their use and usability.

The methodology and corresponding materials need to validly represent the cause and effect relationships between public transit investment and economic growth, and must be easy to use. The final objective was really an important aspect of all the other objectives discussed above.

The following tasks were undertaken to achieve the objectives of this research.

Task 1: ***Conduct a literature search on the relationship between public investment in rural areas and economic impact, with special emphasis given to identifying those factors that could be most sensitive to use of public transportation investment.***

The search of the economic and transportation literature focussed on the descriptors of economic impact that have been used in previous studies. These descriptors or variables included

such things as retail sales, employment or jobs, and local tax receipts. This literature search was conducted through the use of the computerized library search facilities at Georgia Tech.

Task 2: ***Conduct a survey of other states to search for rural economic studies and the role of public works investment.***

This task focussed on finding states that have conducted studies on the impact of public investment on rural economies, and in particular, on the role of transportation investment. The results of this survey were critical to structuring the proposed research. This survey was a targeted survey aimed at states that have similar rural characteristics as Georgia. A telephone survey was used to gather the desired information.

Task 3: ***Investigate and assess methodologies that could be used to estimate economic impact/multiplier effects on public investments.***

A set of evaluation criteria were used to assess the appropriateness and usability of different methodologies found in the literature. These criteria included such things as: incorporation of key factors found in Task 1, level of data requirements, ease of use, relationship to public transit investments, etc. Other criteria included sensitivity to different scales of analyses; data availability; ease of local implementation; and interpretability of results.

Task 4: ***Develop a methodology to be used to estimate economic impacts of rural public transit investment.***

A number of methodologies were reviewed including benefit-cost, the general methodological framework selected. Benefits and costs were calibrated to differentiate between public and private benefits and costs. Public benefits included fiscal improvement. Private benefits included income and employment. Public costs included fiscal support, which were further divided into total federal, state, and local contributions. Private costs are not directly calculable except as op-

portunity costs of fiscal contributions or foregone savings in alternative modes.

Task 5: ***Develop instructions and guides for the methodology.***

This task resulted in instruction manuals and guidance materials that can help officials learn to use the methodology. These materials were written in a straight-forward manner and had numerous illustrations to explain possible applications.

Task 6: ***Hold a training course on using the methodology.***

Although the products of Task 5 provided a good point of departure for users of the methodology, it is important to provide hands-on training. This task developed and held a training course on the use of the methodology of the guidance materials. The location of the course was at Georgia Tech. The course summarized the results of the research project. The proposed methodology was explained and demonstrated, and introductory material was presented on the conceptual frame work that guided the research. Evidence that exists in the literature and in practice that suggests the causal relationships between economic activity and public transportation investment were also discussed.

Task 7: ***Apply methodology in test counties.***

Once the methodology and guidance materials have been developed and used in the training course, counties were to be selected as case study applications. This final report will serve as the guidance material for this training.

3.0 LITERATURE RELATING TO RURAL ECONOMIC ACTIVITY AND TRANSPORTATION INVESTMENT

Attempts have been made for many years to quantify the linkages between public expenditures on transportation and economic development. While extensive literature exists on rural highway expenditures, there is a lack of defined methodology for determining the economic impacts of rural public transportation. Additionally, attempts to expand highway-based methodologies to cover public transit expenditures have not been successful.

The primary method of analysis in most studies on rural public transportation has been the case study. These studies have typically shown that the introduction of public transportation in rural areas has led to a slight increase in employment, while enhancing mobility for a sizeable portion or residents. However, methodologies for quantifying a "multiplier" effect for public expenditures on rural transit have not been well developed. For instance, in *The Economic Impact of Rural Public Transportation*, the Middle Georgia Regional Development Center presented an analysis of the public transit/economic link in Crawford, Greene, Hall, and Peach Counties. A rider survey focussing on service need and rider expenditures suggested that the transit systems in larger or "wealthier" counties may have the opportunity for a more profound economic impact on the region. However, as is the case for a majority of the literature, no methodology for actually making a link was presented or assumed.

Additionally, the Community Transportation Association of America, which provides guidance to rural areas under the Rural Technical Assistance Program, has written several articles highlighting the "success stories" or rural public transit implementation. Once again, the case studies do not prove an actual linkage.

Some successes have been made in developing linkages and multipliers for expenditures on services closely related to rural public transportation. In *Transportation and Economic Development of Coastal Areas in the Pacific Northwest*, Sullivan presented an input-output methodology for estimating direct and indirect economic benefits from transportation investment. The methodology focussed on types of business development most likely to occur in the coastal regions of the western United States. Direct user benefits were defined in terms of accident reduction and travel time improvements. Indirect benefits were estimated using an elasticity-based method to look at the immediate and permanent impacts of an improvement. Overall, the authors found that the "multipliers" for transportation investments in these rural areas are between 1.0 and 2.0.

Also, in *Methodology for Estimating Impact of Transportation Infrastructure on Business Location in Rural Northwest Communities;* TransNow investigated economic development in terms of factors (including transportation) related to business location. The authors suggested that the probability of a business choosing to locate in a specific location depends on whether this is a single establishment firm (SEF) or branch firm. For the SEF, the authors developed a dichotomous choice model under the assumption that the community attracts the specific business. The authors also suggested the use of a conditional logit model for the situation of a business choosing a location (rather than location choosing business).

One of the most comprehensive analyses of this issue was presented in *Economic Benefits of Public Transit* by the American Public Transit Association (APTA). This paper suggested several categories of potential economic benefits of rural public transit investment including attraction of new business, attraction of related services and supplies, increased property

values, increased retail trade and employment, etc. Based upon urban experience with bus systems, the report suggested the employment impact of capital expenditures was about 4,000 direct jobs and 5,600 indirect jobs per $100 million invested.

APTA cited two methods for performing a benefit-cost analysis for rural transportation focussing on intercity bus. The first method, developed in North Carolina, is based on the assumption of consumer surplus as the major component of user benefit; this surplus is defined as the difference in benefits between what a consumer now pays and what they are willing to pay. Net user benefit is calculated by:

$$NB = [(n)(t)(T_A + F_A - T_B - F_B)] + [\frac{1}{2}(N)(1-t)(T_A + T_B - F_A - F_B)] + [(N)(1-T)(F_B)] - [BC]$$

NB = net benefit
N = # of passengers using service
F = fares, or cost to user for each mode
½ = reflects straight line demand curve assumption and loss of surplus
T = time cost for each mode
t = % of trips transferable to auto
BC = bus operating cost

The second method developed in Wisconsin is based on disutility value. A value which considers money, convenience and time factors is first calculated for a bus trip. This value is compared to a disutility value for trips taken by an auto. The equation for this method is as follows:

$$DU_{ijm} = IV_{ijm} + [(c_1)(OV_{ijm})] + [\frac{CT_{ijm}}{c_2}] + c_{3m}$$

where:

Du_{ijm} = disutility of travel between points i and j using mode i
Iv_{ijm} = in-vehicle time for mode m between points i and j
Ov_{ijm} = out of vehicle time for mode m between points i and j
Ct_{ijm} = travel cost for mode m between points i and j
c_1 = out-vehicle time multiplier (represents inconvenience of waiting)
c_2 = value of time
c_3 = mode bias factor

The authors point out that the method is useful for analyzing alternative bus routes; however, it only accounts for transportation costs.

More literature does exist on economic impacts of *highway* investments in rural areas. For instance, in *Investigation of the Relationship Between Highway Infrastructure and Economic Development in Indiana*, Sinha presented two models to explain changes in employment or wage income in various economic sectors. Both models used regression analysis to find relationship between a vector of factors and economic change at the county level. Sinha found that highway mileage was positively related to growth in total industry and service sectors; multilane highway mileage had much greater effect than overall highway mileage; and highway expenditures had a negative association with most economic measures.

In a review of previous studies, Sinha mentioned the following methodologies for estimating economic impacts of highway investment:

> Regression analysis with time-series and cross-sectional data between 1957 and 1982 was used for all counties in Minnesota;
>
> Regression analysis using cross-section data and lagged variables was used in Georgia;
>
> Factor and cluster analyses were used to group counties in North Carolina according to various economic and transportation factors.

In reviewing the state-of-the-practice in assessing economic impacts of public transit investment, a recurring theme throughout the literature is that transportation infrastructure is just one consideration in the complex world of economic development. The relationships currently developed suggest that the strongest linkages between transportation and economic development are in terms of magnitude of infrastructure (such as lane-miles of multilane highway) rather than incremental investment (such as impact of $1 invested in public transit).

In *Transportation and Economic Development - 1990,* Hartgen, et al used factor analysis to determine the importance of highway transportation in manufacturing siting decisions in North Carolina. They found that an extensive network of 4-lane roads is only a moderate factor in future incremental investment decisions for businesses. In the same document, Forkenbrock concluded that good transportation facilities are not enough to ensure economic development. More importantly, the area must be able to attract production, labor, capital, and materials which are primarily influenced by other factors.

Additionally, in *Impacts of Transportation on Regional Development*; Wilson, Stevens, and Holyoke investigated economic development in terms of industrial location decisions in the Atlantic region of Canada. They utilized a location Factor Preference Index (FPI) model with survey data input to develop factor importance. They found that of all public expenditures to enhance development, transportation was only the 6th most important out of 9.

The extent of the literature reviewed is shown in appendix A. This appendix is divided into several sections--general bibliography, economic impact of public spending, multipliers in regional economic impact analysis, economic impact of services, and transportation economic impacts. In addition, appendix B shows the results of selected telephone contacts.

4.0 DEVELOPMENT OF THE METHODOLOGY

4.1 OVERVIEW

Table 1 illustrates some of the types of methods that were found in the literature. This table focuses on four items based on each reference reviewed. First, the methodology part provides a procedure and theoretical approach to identify benefits and costs of transportation investment and economic impacts of investments, which in turn can provide to a decision-maker the basic framework for evaluation of transportation investment projects. The next item is the specific transportation mode each reference focuses on. Although a general approach to analyze the economic impacts of transportation investment is similar to one another, an analysis method may be changed according to the different transportation mode.

The third item is the economic indicators. This column provides different types of economic effects indicating the economic viability of the specific region. These are categorized into direct, indirect, and multiplier effects. These three categories of economic indicators, however, may include different items based on the various analysis perspectives. The final column explains each reference's basic concept on economic development and transportation investment and others which should be notified. Ultimately, this table can be used as a reference for the effects of public transit in investment on rural economic development while providing the general concepts and methodology of economic development and transportation investment.

4.2 BENEFIT-COST METHODOLOGY

Of all the methodologies discussed above, economic benefit-cost analysis was chosen as the

Table 1: Public Investment Methodology and Economic Indicators for Rural Economic Development

Article	TR Mode	Economic Indicators	Study Area	others
(1) Framework for Classifying & Evaluating Econ. Impacts ... (TRR 1274, 1990)	Hwy. Mode	i) 3 types of impacts: - Direct: results of econ. activities carried out on site in the construction & operation of an improvement (e.g.) employment, taxes paid, purchasing of goods & services - Indirect: derive from off-site econ activities associated with production of intermediate goods & services required for the construction & operation (e.g.) services provided by aggregate, asphalt, steel, etc. - Induced: multiplier effects of the two above. (e.g.) Increases in income due to direct, indirect impacts, HHs increase, & their purchasing activities contribute to further changes in production & corresponding changes in other impact variables. ii) total econ. impacts are the sum of the direct, indirect, and induced impacts. (see below for details)	No specific geographical area is indicated	i) Diff. b/w econ. impacts & U-benefit: - U-benefit: measured in terms of time savings, savings from avoidance of delay, etc. - Econ. Impact.: secondary effects of cap. expenditures : income, employment, production, tax revenues, & resource consumption
(2) Econ. Impacts of Transit on Cities (TRR 1274, 1990)	Transit (rapid transit and fixed route bus mode)	i) 3 major econ. benefit indicators: - increase in property value adj. to the transit line - Increase in dev. projects (bldg. permits and visual inspection) along the transit line - changes in business sales adj. to transit lines ii) If these indicators measured are increased, then transit benefits the local economy iii) However, one major problem is its difficulty in quantitatively measuring the indicators.	Major downtown areaa are focused i) Atlanta, GA: selected as a representative of newer city with existing rail system (MARTA) ii) Boston, MA: selected as a representative of older city with existing rail system (MBTA) iii) Dallas, TX: selected as a representative of a newew city considering building a new transit system iv) Hartford, CONN: selected as arepresentative of a smaller city with bus-only transit system	i) Other factors affecting econ. dev. in conjunction with transit investment: - demand for new office spaces or residential areas - healthy overall economy - land availability - favorable land use policy - construction timing

Table 1, cont'd

(3) Framework for Analyzing the Impacts... (TRR 1274, 1990)	Fixed-Guideway Transit	No indicators are specified.	Subject area is not specified	
(4) Evaluation of Econ. & Dev. Impacts ... (TRR 820)	Transit especially rapid transit mode	i)Direct effect of transit inv.: - Land, labor, materials, etc. acquired to construct and operate the system. - Passenger travel that takes place on the system (i.e. user-benefits). ii) Indirect effects: - Econ. impact: employment, income, retail sales, & other changes in private market activities. - Dev. Impact: physical & spatial effects (land use impacts) brought about by the construction and operation of the transit system.	Analysis is mainly concentrated on large urban areas but no specific area is designated	
(5) Estimating Econ. & Dev. Impacts of Transit Investment (TRR 1046)	Transit mode	Construction expenditure, operation & maintenance cost, vs. their gross impacts and job creation	Subject area of the study is focused on urbanized area (Seattle Metropolitan area)	
(6) Broome County Bus Transit Study: Evaluation, Analysis and Rommendations	Bus (Regular Schedule)		Urbanized area is Main analysis area (Broome County, NY - Population: 165,000)	focused on the feasibility of a new transit system in a rural area, focus of report was not so much on the economic indicators
(7) Alternative Investments in the Rural Branch and County Road Systems	Branch rail lines and road investment alternatives	Grain revenues to farmers and elevators, transport cost for delivery of fertilizer, household travel costs for shopping, etc., road maintenance and safety costs and grain elevator investment costs	Rural area is a subject analysis area	

Table 1, cont'd

(8) Methodology for Estimating Impact of Transportation Infrastructure on Business Location in Rural Northwest Communities	Firm Location Methodology SEF - Single Establishment Firm estimates transportation infrastructure impact on location of new business activity (BP_j)=Birth potential of location j Poisson regression model Branch Plant Entry based on the premise that the firm's expected profits are affected by location $\Pi j = F(X_j)+\varepsilon_j$ Πj = profit in location j X_j = set of relevant characteristics Under the assumption that the disturbance follows a Weibull distribution $P[Y_i=j] = \exp\beta' X_j/\Sigma\exp\beta' X_k$ $P[Y_i=j]$ = probability that firm i will locate in SMSA j X_j = matrix of observable characteristics The use of conditional Logit models are appropriate when the choice set contains multiple, unordered alternatives Dichotomous Choice Framework - investigates the effects of transportation costs and services on the location of new manufacturing plants in small communities Ordinary Least Squares (OLS) regression techniques to estimate model $NB_j=\Sigma_i a_{ij} x_{ij} +\Sigma_k \beta_{kj} z_{kj} + \varepsilon_i$ NB_j=1, if community j attracted new manufacturing plant and 0 otherwise X_j contains k socio-economic attributes for the jth community General Qualitative Response Model - including all the factors either for dichotomous or multiple choice estimation $NB_{ij} = f(Z_j, A_j, E_j, T_j, S_j, F_j)+\varepsilon_j$ NB_{ij} = dichotomous or multiple choice dummy Z_j = Vector of location-specific economic factors A_j = Agglomeration factors E_j = Energy prices T_j = Transportation infrastructure S_j = Social indicators F_j = Fiscal indicators	Non-limited-access paved roads Limited access paved roads Rail lines Airlines Nearest metro area Highway access Shipping access Total road miles at location	Factor price indicators (energy prices and construction prices), Labor market characteristics (labor force participation rates and rates of union activity) Not significant to industry location Wage rates, farm crop value, water rates, median home value, per capita personal income, technical expertise (measured by number of engineers in the location)	Rural northwest communities in are focused	

Table 1, cont'd

(9) Road Investment to Foster Local Econ. Dev. (1990)	Case of Iowa's RISE (Revitalize Iowa's Sound Economy) Program: i) Main focus is to distinguish efficient from inefficient projects ii) Project benefits & costs ▪ Br = Wr + (Pr - P*) - C Br: net benefits (income changes) Wr: the sum of the gains and losses to all income recipients other than the owners of the firm if it locates at the project site rather than at the best alternative site and if the road is improved Pr: net income that firm earns on its capital investment if it locates at the project site with the road improvement P*: opportunity costs C: investment costs (costs to the state of the road improvement) • B = W+ (P - P*) B: net benefit if the firm locates at the site without the road improvement project W: same as Wr if the road project is not undertaken P: same as Pr with no road improvement iii) 3 conditions for undertaking a project (see attached figure and table for details) 1. Firm's profitability: compare the firm's profitability at the site without the road improvement with the firm;s profits at its best alternative site (P*) P* - P > 0 2. Cost-effectiveness of road: transportation benefits of road improvement should justify its costs (Br-B) = (wr-w) + (Pr-P) - C > 0 3. Overall net benefits should be positive Br > 0 iv) If these 3 conditions are not met, undertaking the road investment project cannot promote economic development	Road and Highway	Income as a direct indicator Highway benefits & costs: - Benefits: reduction of transportation costs such as decrease in travel time, increase in safety, and decrease in fuel costs , etc. - Costs: investment costs including the future maintenance and operating costs (see attached copy for empirical data and fidings)	This study includes urban and rural areas but primarily focused on rural areas in State of Iowa	i) Basic rule for road investment to facilitate local econ. dev. should be based on "efficiency". ii) Justification of econ. dev., in other words, is not job creation but increases in income

Table 1, cont'd

(10) Public Sector Participation in Local Rail Service (1992)	Case of Illinois State Rail Plan i) Methodology for analying rail line project proceeds in 2 phases, line viability and economic analysis ii) Line viability: addressing itself to whether the line makes a positive net contribution to the operations iii) Econ. analysis composes of economic, transportation, & public benefits 1. Trans. benefits: costs that would be saved by the investment, equal to the difference in trans. costs of affected traffic from origin to destination using the investment proposal and no-investment option; the comparisons are usually comprosed of rail costs (the proposal) and truck cost (do-nothing option) 2. Economic benefits: retention of employment base and the benefits of creating new jobs at the proposed investment center 3. Public benefits: the savings in governmental expenditures and the reduction in other costs to the public; costs in this analysis are the net project costs which include capital & labor costs minus the salvage value of the project at the end of its life	Rail transit mode	No specific indicators are identified		The decision determining which benefits tocount is tied to who paid for the project; that is, if the project is paid for through federal funds, then no transfer effects should be counted and only transportion benefits should be examined. However, if the project is financed by a community, the community will view economic transfers as a benefit. • Transfer effect is an economic effect due to the movement of the industry to the other location.

Table 1, cont'd

(11) Transit-related Joint Development in Smaller Cities: An Appraisal of Opportunities and Practice	Costs and Benefits From the perspective of transit, whatever success the project has enjoyed is not particularly large, compared to the amount of federal and local public dollars devoted to it (transit has incurred higher operating costs)	Cedar Rapids Ground Transportation Center: Fixed routes Buses Taxis Special Services for handicapped and elderly Greyhound Trailways	Downtown Redevelopment (see below for empirical data & findings)	Study is center in small-sized urban and rural areas: i) Cedar Rapids, Iowa : urban, population of 107,317 ii) Davenport, Iowa : urban, population of 100,000 iii) Fargo, N. Dakota : rural, population of 61,000 iv) Demopolis, AL: rural, population of 7,000	specific objective to evaluate the potential for transit-related joint development in smaller communities
	Investment in the facility has had no real effect on the area's economy considering the large amount of federal investment	Davenport Ground Transportation Center: Fixed routes Demand responsive Buses Greyhound Trailways	Downtown Redevelopment (see below for empirical data & findings)		
	Had some effect on the encouragement of downtown redevelopment, whether this positive effect is worth $4 million and whether more beneficial public investment projects could have been built instead are open questions	Fargo Ground Transportation Center: Fixed routes Demand responsive Buses Greyhound	Downtown Redevelopment (see below for empirical data & findings)		
		West Alabama Public Transportation Flexible routes Demand Responsive	No Economic Indicators (just improved the transit system)		

(1) Article # 1

a. Classification of Econ Impacts is broken down as affecting the following area (5) : Business & Ind., Recreational, Tax revenue, Regional & Community, and Resources (see the attached copy).

Table 1, cont'd

b. One example of hypothetical evaluation framework

	Improvement Alternatives ($)		
	Publicly owned & managed	Pub. owned & Privately operated	Other alt.
Improvement Cost: construction maintenance			
U-Benefits: travel time savings veh. operating savings accident savings			
Econ. Impacts: *1) facility construction business growth increase in land value increase in jobs tourism & recreation			
Total Benefits & Impacts			
Tax Revenues			

*1) needs to specify for quantitative analysis; unfortunately, no method for calculation is found in the article.
- This example is provided depending on method of transit ownership and management.
- Based on the improvement alts. the elements of improvement cost, U-benefits, and econ. impacts can be differently identified and selected.
- Another example of Improvement alts mat be based on service mileage & area: difference on how large area, how long route, and/or how often.

(2) Article # 5

a. Construction expenditures: econ. impact of the project construction phase

- Categorize the actual capital cost - major investment (veh., guideway, stations, propulsion), TSM projects (HOV lanes, ramps, and signals), and other capital costs (buses, bases, park and ride lots on other components of the transit system)
- Adjust to estimate the proportion of each capital expenditure category that would be incurred w/in the metro region (project area) (magnitude of capital costs, particularly in major investment part, vary tremendously across the various alts).
- Therefore, capital costs are modified by these percentages as an estimates of the actual cap. exp. that would be made in materials & labor.
- These annual capital exps. for each alt. are entered into the " PSCOG STEP83 regional econometric model.
- STEP83 MODEL calculates jobs, estimates total output gain, and provides an estimate of the multiplier; to be specific, direct expenditure & jobs, total expenditure & its multiplier, total jobs & its multiplier for each alt.
- total impacts & multipliers measured above are based on the assumption that all of the capital costs to be expended within the region during the project years would be new funds granted from outside; however, this assumption conflicts with actual situation (no more than 1/2 of the total project costs would be covered by federal grants).
- Make a new assumption: no federal grants for no-build alt., 50% of the total capital costs would be covered by federal grants for 2nd & 3rd alts. Additionally, it is assumed that the cap. exps. for materials within the region would generate some tax revenue, amounting to 8 percent on an assumed 50% for materials.
- Re-run the model based on the new assumption.

b. Dev. impact : use the DRAM/EMPAL urban activity model.

c. Empirical data & findings:

* Regional economic impact of capital expenditures (no local share assumption, 1984-2000) - see next page

Table 1, cont'd

Alternatives	Expenditures [a] Direct Regional ($)	Total Impacts ($)	Jobs [b] Direct	Total
No Build	159.4	326.8	1.9	5.1
Advance Tech. Bus/Tunnel	554.2	1108.4	6.8	17.6
Light Rail System	980.1	1989.6	11.8	30.9

a. Millions of 1983 dollars
b. Thousands of job-years

* Regional economic impact of capital expenditures with 100-50-50 local share assumption

Alternatives	Expenditures [a] Every-where ($)	Within Region ($)	Total Impacts ($)	Jobs [b] Direct	Total
No Build	452.7	159.4	583.9	1.9	-16.3
Advance Tech. Bus/Tunnel	979.7	554.2	397.2	6.8	-0.4
Light Rail System	1462.2	980.1	996.6	11.8	6.3

a. Millions of 1983 dollars
b. Thousands of job-years

(3) Article # 11

a. Cedar Rapids: Remove blight areas and strengthen tax base while improving transit system
   - $30 million of project cost including construction cost of office tower and housing complex
   - investment of $13 million for office tower, $3 million for housing complex, $7 million for public library, and $6.5 million for private development in seven block areas around Ground Transportation Center; as a result, increases in property value (not specific value amou is indicated)

b. Davenport: Cost of $5.6 million is invested for transit improvement

c. Fargo: $4.7 million of project cost and $70 million of private investment in Fargo dowmtown area

most appropriate general methodology. Benefit-cost analysis compares the anticipated benefits and costs of a proposed transportation project or system to determine not only its feasbility, but the ratio (multiplier) of benefits to costs as well. Benefit-cost studies, for example, are required by the World Bank to determine whether investments in Third World transportation systems are positive and improve gross domestic product. The advantages of benefit-cost analysis over other methodologies include:

High level of adaptability to local economy.

Relatively low sensitivity to different geographic scales of analysis.

Relatively high level of data availability at reasonable cost.

High level of ease of local implementation.

High level of interpretability of results.

Table 2 compares benefit-cost analysis with other methodologies to further illustrate the point.

4.2.1 Perspectives On Impacts In The Analysis of Rural Transit Systems

Impacts of rural transit system can be viewed from a variety of perspectives. They can be analyzed from the perspective of transit users (users' impacts) or that of the transit providers (public impacts). From the viewpoint of transit providers, rural transit systems will have impacts on overall economic development and on fiscal revenue. In addition, the economic and fiscal revenue impacts can be estimated at the federal level, state and local level. Economic impact will vary with different perspectives.

Table 2: Benefit Cost Analysis Comparison To Other Methodologies

Methodology	*Adaptability to Local Economy*	*Sensitivity to Different Scales of Analysis*	*Data Availability at Reasonable Cost*	*Ease of Local Implementation*	*Interpretability of Results*
Aggregate Models	Inappropriate	Inappropriate	Inappropriate	Inappropriate	Inappropriate
Quasi-Experimental Analyses	Low	Moderate	Relatively High	Low	Moderate
Econometric Studies	Low	High	High	Low	Moderate
Input-Output Models	Relatively Low	High	Moderate	Relatively Low	Moderate
Firm Location Analyses	Moderate	Relatively Low	Moderate	Relatively Low	Moderate
Benefit-Cost Studies	High	Low	Relatively Low	Relatively High	High

Users' Impacts Versus Public Impacts: There are two basic impacts of rural transit systems: the impact on individual transit users and the impact on public transit providers. The benefits to transit users refer to transportation consumers' surplus, including increasing accessibility, mobility and income improvements. The costs to transit users include transit fare costs, travel time costs or opportunity costs. Public impacts of rural transit include economic and non-economic benefits and costs. Economic benefits are the benefits to the economy provoked by changes in transportation system and subsequent changes in mobility and accessibility, involving overall economic benefits and fiscal revenue benefits. Non-economic benefits are those for which it may be difficult to assign a monetary value associated with rural transit service such as reductions in air pollution and other environmental benefits. Non-economic benefits also include those intangible benefits that defy direct measurement but which are real such as allowing a rider to feel connected to the community in which they live because of access to places they would not otherwise frequent. This study focuses on the economic benefits and costs on the public providers of rural public transportation services rather than the service users.

Overall Economic and Fiscal Revenue Benefits: Overall economic benefits refer to benefits to the economy as a whole provoked by changes in transportation systems. They include such benefits as value added in retail sales, service and housing, as well as their indirect and induced multiplier effects on other sectors of the local economy. Fiscal revenue benefits are fiscal revenues that are generated from local economic development (including taxes and user fees), fare revenues from transit users and fiscal revenue transferred from non-local governments (i.e. state and federal agencies) to the local government for transit service.

Fiscal revenue benefits reveal fiscal revenue gained from economic development; they measure the amount of revenue added to the local governments. Public costs include fiscal support to provide transit services, including fixed costs, maintenance and operation costs, which can be further divided into federal, state and local contributions.

The Scale of Economic Impacts: Economic impacts of rural transit services can be analyzed at different scales, i.e., national, state and local levels. The resulting impacts will vary depending on different analytic scales. For example, one economic benefit of a rural transit system is transporting consumers from their homes to the shopping areas of a county. The county gains local retail sales, but those sales are merely diverted from other counties or states where those people may shop or to order by mail. Thus, the national economy may not benefit much from a local county transit system, but the local economy certainly improves. This study evaluates benefits and costs of rural transit systems from the perspective of local (county) government, recognizing that most of these benefits are merely pecuniary benefits, i.e., benefits shifting from one county to another rather than net benefits generating from the transit service. Although the transfer benefits may not be important for the national economy as a whole in the pure economic sense, they are very important to retain the vitality of rural economy and rural communities.

4.3 BENEFIT ANALYSIS OF RURAL TRANSIT SERVICE

Most riders of public transit in rural counties of Georgia are elderly and disabled. There

are only about 1.5 million rural transit trips per year as shown in Table 3, which is equivalent of one trip per rural resident per year. Over half of riders are elderly with age over 65 years; and about 11 percent are people with disabilities. There may be some overlap between the elderly and the disabled riders; some people with disability may also be the elderly, and vice versa. The aggregated data do not allow us to disentangle the two groups. Other riders account for only about 38 percent of the total ridership.

The trip purposes for rural transit riders are widely distributed among shopping, medical, social and recreation, work, school and other unclassified trips. Among the identified trips, shopping is the most frequent trip, accounting for 25 percent of all trips, followed by social and recreation trips (14 percent), and medical trips (12 percent). The work and school trips are the least frequent trips, accounting for only 9 and 7.7 percent, respectively. The available data do not allow us to distinguish the trip purposes by age group.

The data indicate that most rural transit riders are "transit dependent". This is not unique to rural Georgia. Other studies also identified that rural transit users are mostly transportation disadvantaged, being elderly, physically disabled, and/or careless (Kidder, 1976).

Because most patrons of rural transit service are the elderly, the handicapped and the careless, this study focuses on the economic benefits of these transit dependents. There are few data on the earnings and expenditures of the handicapped, and there is overlap between the elderly and the handicapped. Therefore, this study focuses on the economic benefits of the elderly riders. In addition, rural transit service is essential to careless workers because there are few alternatives to them, notwithstanding they are a small portion of the rural worker force. Experience from rural transit providers reveals that most of these transit work trips are

Table 3: Characteristics or Rural Transit Riders

		Riders			Trip Purpose					
	Total Trips	Elderly	Disabled	Others	Medical	Work	Education	Shopping	Social & Recreation	Other Purpose
Number of trips	1,565,790	798,226	175,534	592,030	185,134	140,437	120,138	383,960	218,141	517,980
Shares		51.0%	11.2%	37.8%	11.8%	9.0%	7.7%	24.5%	13.9%	33.1%

made by young workers. There is little overlap between the elderly riders and the work trips.

Providing transit service to the elderly and disabled is the major objective of rural transit service. Local governments are obligated to provide accessibility and mobility to the disabled according to the Americans with Disability Act (ADA). In addition, by improving the mobility and accessibility for the elderly and the handicapped, rural transit service also helps retain the vitality of rural communities, increase the linkage between rural residents and rural economic activities, and improve rural economic development. Without transit services, some residents without a car may be forced to relocate to other areas where transit service is available; others may have to purchase a vehicle. The purchase of additional vehicles will generate more auto dependency and create more traffic and environmental problems. Those residents who relocate for lack of transit service is of primary interest to the public benefit-cost analysis of the local government, while purchasing a vehicle is of primary interest to the transit users' benefit-cost analysis of individuals, as well as social and environmental externality analysis. Because the focus of this study is the economic impact of rural transit, the costs and benefits of vehicle ownership is not discussed here (Litman (1995) offers an interesting discussion on automobile dependency as a cost).

Rural transit service also facilitates those workers who do not own a car, or one-car households with two workers, to secure a job that they may not get without it. The lack of transit service would cause hardship for workers without automobiles. About 8 percent of workers living in rural areas take transit to work (1990 NPTS). In Georgia, about 2.8 percent of all work trips were made by transit in 1990, but only 0.67 percent of workers taking transit to work reside in rural areas (County and City Data Book, 1994). In the absence of transit service, these workers could not work, or may only work within walking distance, perhaps earning the minimal wage. Without alternative commute modes, some of them would be forced to purchase an automobile, and some of them have to relocate to urban areas where they are more accessible to jobs.

4.3.1 Benefit Analysis of Transit Service to the Elderly

About 15 percent of the households in rural areas in the United States with a household-head aged 65 or over have no automobile (data from the 1990 Nationwide Personal Transportation Survey (NPTS)). Among those zero-vehicle elderly households, 16 percent of them depend on transit (Lave and Crepeau, 1994). The rest may rely on kith and kin for their transportation needs. In other words, about 2.4 percent of the elderly in rural areas are transit dependent. In the South Atlantic region, about 17.5 percent of elderly households in rural areas have no automobile, and 9 percent of these households depend on transit (1990 NPTS data). Therefore, about 1.6 percent of the elderly in rural areas at the South Atlantic region are transit dependent. As there are only a few sample households from rural Georgia in the 1990 NPTS, the sample data are too small to be reliable. The South Atlantic region average of

transit dependence is thus applied to the rural Georgia.

The number of elderly who are transit dependent in a county or state is estimated using 1.6 percent of the population that is 65 years old and older. The contribution of these transit dependents to the economy is determined by their demand to or expenditure on goods and services. The expenditure of those transit-dependent elderly adds value to the economy.

According to the 1991 Consumer Expenditure Survey by the Bureau of Economic Analysis, the elderly population spend about 98.5 percent of their before-tax income and 105 percent of their after-tax income annually (usually dipping into savings). The key question is how much of the elderly expenditure is spent locally, because some of the expenditure may be spent in larger counties with wider ranges of commodity choices. This outside spending will have little impact on the local economy.

To determine the local share of elderly expenditures, this study considers the relative concentration of retail sale and service industry in the county to the state average. If there is a high concentration of retail sale and service industry in the county, the local residents will be more likely to patronage these local retail and services, and thus more likely to spend the money inside the county. If the local retail and service industry is small and it cannot meet the needs of local residents, residents may need to go to larger counties. This is similar to the location-quotient concept widely used in the regional economics in the analysis of regional import and export sectors (Sullivan, 1990). The formula to estimate the portion of local expenditure (P) is:

$$P = \frac{\left(\frac{\textit{County employees of retail sale and service industry}}{\textit{County population}}\right)}{\left(\frac{\textit{State employees of retail sale and service industry}}{\textit{State population}}\right)}$$

The denominator is the share of retail sale and service employees in the state. It provides a measure of how many retail and service employees are needed to satisfy the local demand for retail and services for the state average. For example, for the state as a whole, it takes about 139 employees of retail sale and service to meet the needs of a thousand population. If a county actually has only 100 employees in retail sale and service industry per thousand population, some of the retail and services may be acquired from outside the county, i.e., some expenditure of county residents will likely be spent outside the county. If the county has 150 employees in retail and service industry per thousand population, the expenditure of local residents is more likely to be spent locally. In addition, the larger concentration of retail and service industry will draw customers from other counties.

If P is equal or larger than 1, all elderly expenditures are assumed to be expended locally, i.e., within a county boundary. If P is smaller than 1, the total expenditures will be adjusted by the factor P. It assumes that only P percent of expenditure will be spent locally.

It should be noted, however, that the match and mismatch of retail and service industry and local demands depend on the type of services and goods that are provided by the industry and are desired by local residents. If the amount and the types of retail and services provided in the county can exactly match the local residents' needs, even though there are only 50 employees in the retail

and services per thousand population, they are still attractive to local dollars. However, this needs very detailed information regarding the type of service and goods that are provided by the local industry and are desired by local residents. This information is currently unavailable and is difficult to obtain.

The expenditure on local goods and services stimulates production of local industries and services. In other words, the local expenditure will have indirect and induced effects on other sectors of the economy. The inter-industry relationships within regions are usually represented by regional input-output (I-O) multipliers, which account for interindustry relationships within regions. Regional I-O models are useful tools for regional economic impact analysis (Beemiller, 1990; Strathman and Dueker, 1988).

We derive coefficients of the output multipliers from the Regional Input-Output Modeling System (RIMS II) published by the Bureau of Economic Analysis (BEA). These direct requirements coefficients are derived from the 1987 benchmark input-output accounts for the U.S. economy, which shows the input and output structure of more than 500 industries, and 1992 regional data, which is used to adjust the national direct requirements coefficients to show a region's industrial output and trading pattern. Regional multipliers for industrial output, earnings, and employment are then estimated on the basis of the adjusted coefficients.

The expenditures for services and products are changes in final demand; the impacts are estimated by multiplying each final-demand change by the appropriate RIMS II multiplier. It should be noted that the expenditures for manufactured goods reflect charges for the output of wholesalers, retailers, and transporters, as well as of manufacturers. Assume that the wholesalers, retailers, and transporters are located in the county and the manufacturers are located outside the

county, then the charges for wholesale trade, retail trade, and transportation output (but not manufacturing output) are changes in final demand in the county.

To calculate the economic impacts on the county of the expenditures by the elderly for manufactured goods, the expenditures for each good must be converted into final-demand changes in wholesale trade, in retail trade, and in transportation. For each good, the final-demand changes can be estimated by multiplying the final expenditure by the percentage shares of national personal consumption expenditures (PCE) for the goods that are accounted for by the wholesale trade, retail trade, and transportation industries. For example, the final-demand changes associated with the expenditure for food can be estimated by multiplying the expenditure on food by the shares of national PCE for food that are accounted for by wholesale trade margins (9 percent), retail trade margins (23 percent), and transportation costs (2 percent).

To simplify the calculation of the economic multiplier effect, the total multiplier of elderly expenditures is a weighted multiplier, using the share of expenditure on each product or service as the weight. Furthermore, to take into account the effect of county size, two weighted multipliers were calculated for the elderly expenditures. One is for smaller counties, using the RIMS II multipliers in rural southwest Georgia; and the other is for larger counties, using the average RIMS II multipliers in the State of Georgia. The calculated weighted output multiplier of the elderly expenditure for smaller counties is about 1.3, and about 1.7 for larger rural counties with 1990 population over 70,000.

Once the annual expenditure and the consumption patterns are known, the key question is to determine how many elderly residents will relocate and how many will purchase a vehicle if there is no transit service in the community. There are no data indicating the proportion of residents

who may relocate and the proportion of residents who may stay and purchase a vehicle. The decision of residential location and transit mode choice is a self selection process (Peng, et al, forthcoming). People who like to take transit are more likely to reside in an area where transit service is available, and people who do not like to take transit are more likely to make their residential location choice based on factors other than the availability of transit services. In the absence of transit service, fewer transit-dependent residents would choose to live in the area. In the case of discontinuation of the current transit service, most of those transit-dependent residents will be more likely to relocate than stay and purchase a vehicle. This is true especially in the long run. Furthermore, those elderly who do not currently own a vehicle may have difficulties in operating a vehicle, or incur economic hardships in owning a vehicle. Without transit service, these households will be less likely to purchase a vehicle. Therefore, it is reasonable to assume that most of those transit-dependent elderly households would relocate out of the county in the absence of rural transit service.

The total annual economic benefit from elderly riders is calculated from the number of elderly that are transit dependent times the amount of annual expenditure per capita. These expenditures are adjusted by using the percent of per capita retail and service employees over the state average (P) to get the local portion of the expenditure. The local expenditure is then multiplied by the economic output multiplier to get the adjusted total multiplied economic benefits per year. The estimated economic benefits of the elderly riders for all rural counties is shown in Table 4.

Table 4: Economic and Fiscal Benefit/Cost Analysis

Economic Benefits		Fiscal Benefits		Fare Revenue	Costs	
Elderly Riders	Work Trips	Elderly Riders	Work Trips		Federal Subsidy	Local Budget
56,235,702	54,938,111	2,381,426	2,123,228	$ 735,651	$ 1,671,059	$ 2,213,620

With Federal Subsidy				Without Federal Subsidy			
Economic Impacts		Fiscal Impacts		Economic Impacts		Fiscal Impacts	
Net Transfer Impact	Benefit/Cost Ratio	Net Transfer Impact	Benefit/Cost Ratio	Net Transfer Impact	Benefit/Cost Ratio	Net Transfer Impact	Benefit/Cost Ratio
$111,366,902	50.31	$ 4,697,745	2.12	$ 108,024,784	27.81	$ 1,355,627	0.35

4.3.2 Fiscal Revenue Benefits of Elderly Transit Riders

In addition to the economic output impact of transit service, the local (county) governments also have fiscal revenue impacts. Fiscal revenues of county governments are generated mainly from county taxes and user fees, as well as intergovernmental revenue transfers. Because of the complexity of different taxes and user fees, it is difficult to calculate fiscal revenue impacts directly from consumer expenditures. As a proxy, this study uses the proportion of the county own-source revenue over the total personal income as a local revenue generating factor. It should be noted that the amount of the county own-source revenue is dependent on the rate of taxes and user fees. A higher tax rate and user fee will generate higher fiscal impacts, and a lower tax rate and user fee will generate lower fiscal impacts. The state average of the local revenue generating factor for Georgia is about 5.22 percent.

The total revenue impacts are the product of the total income of transit dependent elderly

and the local revenue generating factor. The estimation of revenue impacts of the elderly riders for all rural counties in Georgia is shown in Table 4.

4.3.3 Benefit Analysis of Transit Work Trips

Transit share in work trips is very small in rural Georgia. Only about 0.67 percent of workers take transit to work. It is lower than the state average of 2.8 percent transit work trips and the national rural average of 7.9 percent. Among the transit trips, about 9 percent are work trips (see Table 3). In spite of a small portion of the work trips, transit service is essential to those workers. The small portion of workers who are transit dependent are either too poor to afford a car or have only one car in a two or more worker household. Indeed, according to the 1990 NPTS data, the average income for rural workers in the South Atlantic region who are transit dependent is only about three fourths of that of all workers in the rural areas. Without transit services, most of these workers could not work or could only work within walking distance with a less pay. It can be reasonably assumed that without transit service, most of these transit-dependent workers will lose their current income. Therefore, the average income of those transit-dependent workers can be considered as the earned income benefit from rural transit service.

The earned income benefit will also have a multiplied impact on the local overall economic development. Similar to the economic output multipliers for the elderly, the economic output multiplier is calculated from the average expenditure patterns. The weighted output multipliers for smaller and larger rural counties are 1.44 and 1.88, respectively. The product of the earned income benefit and the economic multiplier is the economic benefit of the rural transit service.

The revenue impact can be directly derived from the economic benefits, which is the product of the revenue generating factor and the earned income benefits. The estimation of economic and revenue impacts of transit work trips for all rural counties in Georgia is shown in Table 4.

4.4 COST ANALYSIS OF RURAL TRANSIT SERVICE

Providing and using rural transit service involve different costs. For the transit service providers, there are costs of maintenance, operation and management. For transit service users, there are costs associated with travel time and fare. Because the focus of this study is on the costs and benefits of providing transit service by rural county government, the costs (and benefits) of transit users are not included in this analysis.

In the aggregate, costs of providing transit service include the fixed costs of purchasing buses or vans and the operating costs (maintenance and management costs). The annualized fixed costs can be estimated using the annual depreciation derived from the purchase cost of a vehicle divided by the number of years needed to replace it. The operation costs can be mostly represented by the total operating budget for transit service.

The average purchase price for a standard bus (van) that is used in most rural counties is about $20,000, with a replacement period of about 5 to 6 years. The annualized fixed cost of one vehicle is about $3,300 to $4,000. The average purchase price for a larger bus is about $40,000, which lasts about 7 years. So the annualized fixed cost of a larger bus is about $6,000. Because the proportion of standard buses to larger buses owned by rural counties is not currently available, after consulting with transit service providers, we assume an annualized average fixed costs of about $5,000 per vehicle.

The total operating budget includes revenues from the federal and local governments, as well as fare revenues. Fare revenue is generated from users, which is not part of the operating costs. Furthermore, if the cost-benefit is calculated on the local (county) government level, the federal subsidy would not be considered part of the local government costs. Therefore, only the budget from the local government itself represents the "local costs" of providing transit service.

4.5 BENEFIT COST ANALYSIS OF PROVIDING RURAL TRANSIT SERVICE

The overall economic benefit-cost and fiscal impact analyses are applied to transit dependent elderly and workers at the county level. In addition, the economic and revenue benefit-cost analysis are also conducted in situations of the current level of federal transit subsidy and in the absence of federal transit subsidy.

The benefits of local transit service include benefits from elderly riders and benefits from transit work trips. Furthermore, from the stand of local government, fare revenues from transit users and revenue from federal transit subsidies are also considered (transfer) benefits of providing transit service. Without transit service, the federal transit subsidy would not be granted. The costs of providing local transit service include fixed costs and operating costs. The net gain or loss is the difference between total benefits and total costs. The benefit-cost ratio is the product of total benefits divided by the total costs, which is the ratio of net gains or losses to one-unit (dollar) of investment. The net economic and revenue gains (losses) for the state's rural counties with transit service were shown in Table 4.

The economic impact of rural transit service for the state as a whole (including rural

counties with transit service only), given the current level of federal transit subsidy, is positive, and the benefit-cost ratio is much larger than 1.0. Even in the absence of federal subsidy, assuming the local governments pay all the operating and fixed costs, the local economic impacts are quite positive and the economic benefit-cost ratio is larger than 1.0. The revenue impact is also positive, but the revenue benefit-cost ratio is smaller.

The economic benefit is quite large. Investing one dollar of local money in transit service generates about $50 of total economic output in the rural counties, given the current level of federal transit subsidy. Excluding the federal transit subsidy and assuming the local governments pay all the costs, a one-dollar investment still generates about $28 of economic output for the rural counties in Georgia. The economic benefits seem to be large but reasonable. The average cost of one round transit trip (excluding fare) is about $2.15 in rural Georgia (Georgia DOT estimates). The economic benefits of $28 from one-dollar investment in transit service can be interpreted as follows: a round trip costs transit providers $2.15, which results in a multiplied expenditure of $60.20 ($2.15*28) and the direct expenditure of $32 (excluding the multiplied effect, $60.20/1.88) per transit trip. This expenditure of $32 per trip is a reasonable amount of expenditure or income for an average transit trip, whether the trip is made for shopping, medical, or work.

The fiscal revenue impact of local governments resulting from providing transit service is much smaller than the total economic output impacts. It measures the return of investment to the local government itself. It is thus a more direct measurement of investment-return ratio. With the subsidy from the federal government, a one local dollar investment in transit service will generate about $2.12 of revenue returns. Without the subsidy from the federal govern-

ment, the local government has to pay all the costs, a one-dollar investment results in $0.35 revenue returns. The revenue return is positive, but the revenue benefit-cost ratio becomes small.

4.5.1 Marginal Benefit-Cost Analysis

The net economic and revenue gains shown in Table 4 are the average gains of the current transit service. However, these net economic and revenue gains cannot be interpreted as the marginal gains. Average economic and revenue gains are calculated by subtracting total costs from the total benefits, while the marginal gain is the additional benefit from providing one more unit of transit service. The concept of marginal benefit and marginal cost is illustrated in Figure 1.

At a low level of transit service, the cost of providing one more unit of transit service is low but the benefit is low too, because only a few people can use the service. As more service is provided and more people use the service, the operating cost increases and so do the benefits, the net marginal benefits increases. As the service provided can serve the most people's needs, the total benefit reaches the maximum point. Beyond this point providing more service will not generate more economic benefits for the service provider; the marginal operating cost will increase dramatically, but the net marginal benefit will decline.

The economic and revenue benefits presented in this paper are the maximum benefits based on the number of population and number of transit users in 1992. Assuming the population of transit-dependents is constant, and the current service can adequately meet customers' service demands, improving transit service by increasing service frequency will not add much econ-

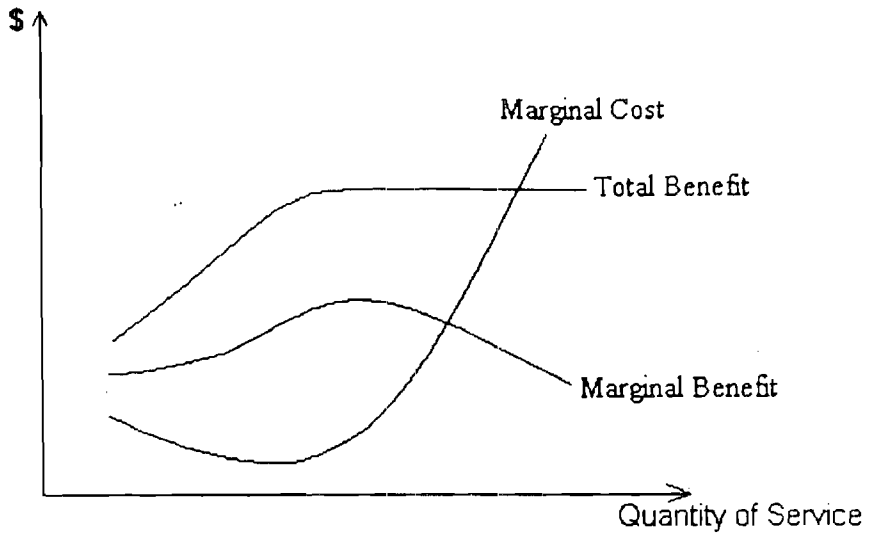


Figure 1. An Illustration of Marginal Benefit and Marginal Cost

omic and revenue benefits. Rather, it will increase operating costs, because the revenue recovered from the fare is less than the increase of operating costs. Therefore, improving transit service will reduce the marginal benefits, although it may increase the convenience of the riders. The marginal benefits will become smaller.However, when the elderly population increases as indicated in the national population growth trend, and/or current transit service is not adequate to meet riders' demand, improving service may increase economic and revenue benefits. Furthermore, a better transit service may draw workers and businesses from other regions, and may induce more transit users. The generated economic benefits will increase accordingly. These generated benefits from population and business migration is difficult to measure because of a lack of reliable data.

Will reducing the transit service increase the net benefits? This will be determined by the number of riders and consumers lost from a service change, as well as current level of transit service provided. If the economic loss of the lost riders and consumers is larger than the cost reduction, the net benefits will drop. If the economic loss for the lost riders and consumers is

smaller than the cost reduction, the net benefits will increase. Further analysis is needed to estimate the ridership fluctuation with service changes. The adequacy of transit service can be determined by whether the current service provided can meet the demand from the users. This can be evaluated because many rural transit services in Georgia are demand-responsive service.

5.0 USERS GUIDE

This section provides guidelines for the use of the benefit/cost methodology. As such, this section can act as stand-alone guidance material. However, there are many caveats that need to be considered at the outset. Most importantly, this methodology was developed using regional and state averages. For those counties where better local data is available, users are encouraged to substitute their own values.

Other important caveats include:

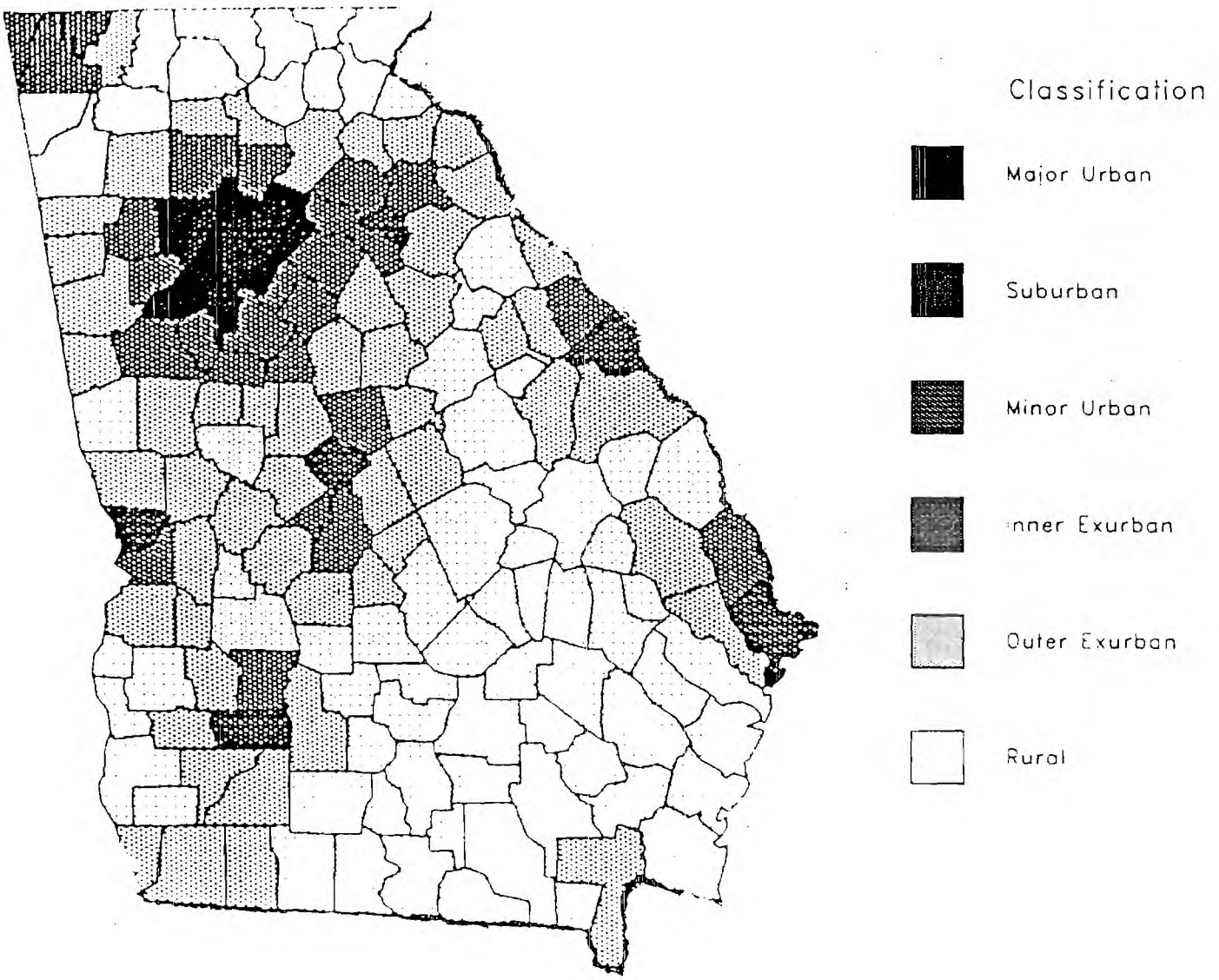
1. The methodology focuses on the economic benefits and cost related to rural transit service. Many studies have shown the social and psychological benefits of enhanced mobility. However, these benefits are hard to quantify in dollar terms, the basic unit for benefit/cost analysis.
2. The methodology is simple to understand and use. Straight-forward relationships form the basis of benefits and costs estimation. Substituting local values is simply a matter of changing a line in a spreadsheet.
3. The model can be used for two major purposes: to determine the impact of transit service on the State's economy and the impact on individual counties.
4. The measurable impacts on two population groups - the elderly and workers who use transit.

These two groups are the major users of rural transit, although not the only users. Therefore, the estimates that result from this methodology are fairly conservative from the perspective of the total benefits of the transit service.

5. The methodology as developed is only applied to those counties classified as rural, inner and outer exurban counties. Figure 2 shows those counties in Georgia that meet different classification categories.

The following steps are described with the aid of Tables 5 to 10. As noted previously, if users of the methodology have better data that can be used, they are encouraged to do so.

Figure 2: Georgia County Classification



Step 1: Estimation Economic Benefits of Elderly Riders

Table 5 shows the approach for estimating the economic benefits associated with elderly riders.

- Obtain annual per capita income (default values from county and City Data Book)
- Estimate number of elderly who use transit (multiply total population by percent 65 or over by percent 65 or over without car by percent of this group who use transit)
- Multiply number of elderly transit riders by annual per capita income by percentage expenditures represent of annual per capita income (default value 1991Consumer expenditure Survey). This results in total economic benefit from elderly riders.
- Multiply total economic benefit by percentage of county retail and service employees compared to state average. Multiply by 1.74 which is multiplier factor for associated economic benefits associated with elderly riders. This results in total annual economic benefit from elderly riders.

Table 5: Economic Benefits of Elderly Riders

$	17,503	Amount of annual income per capita (1994 dollars, County and City Data Book).
	98.46%	Percentage of expenditure of the elderly over annual income (1991 Consumer Expenditure Survey).
	1,526,099	Total population (all rural counties, 1992)
	10.84%	Percentage of population with age of 65 and over.
	165,367	Total population with age of 65 and over.
	17.50%	Percent of elderly 65+ without car (1990 NPTS data, South Atlantic Region),
	9.00%	Percent that use transit (1990 NPTS, South Atlantic Region).
	2,605	Number of elderly that have to use transit.
$	44,882,252	Total annual economic (transfer) benefit from elderly riders.
	72.07%	Percent of per capital retail and service employees over the state average.
	1.74	Multiplier factor.
$	56,235,702	Adjusted total annual economic benefit from elderly riders.

Step 2: Estimate Revenue Benefits for Elderly Riders

Table 6 shows the approach to estimate revenue benefit of elderly riders.

- Obtain annual per capita income
- Estimate revenues from taxes and State rebates to the county. Estimate total personalincome for the State or County. Both estimates come from the County and City Data Book.
- Estimate percent of local tax revenues as compared to average personal income by dividing the above two values.
- Multiply number of elderly riders that use transit by percentage tax revenues to get fiscal revenue benefits from elderly riders.

Table 6: Revenue Benefits of Elderly Riders

$ 17,503	Amount of annual income per capita (in 1994 dollars).
$ 1,325,143,009	Own-source revenues (1994 dollars) [County and City Data Book 1994.]
$ 25,366,460,899	Total personal income (1994 dollars) [County and City Data Book 1994.]
5.22%	Percent of own-source revenues to personal income.
2,605	Number of elderly that have to use transit.
$ 2,381,426	Fiscal revenue benefits from elderly riders.

Step 3: Estimate Economic Benefits of Transit Work Trips

Table 7 shows the approach to estimate the economic benefits of transit work trips.

- Estimate percent of rural workers using transit for work trip (default 0.67%)
- Multiply this percentage by total number of workers in rural Georgia.
- Estimate percentage of workers who would lose jobs or only get minimal wage jobs without transit service (default 60%)
- Obtain average wage for workers who use transit. Multiply this average wage by number of workers who use transit to get to work by percentage who would lose jobs without transit to get total annual economic benefit.
- Multiply total economic benefit by percentage of county retail and service employees compared to State average. Multiply by 1.88 which is multiplier factor for associated economic benefits with workers. This results in the total economic benefit from work trips taken by rural transit.

Table 7: Economic Benefits of Transit Work Trips

	0.67%	Percent of workers taking transit to work (County and City Data Book, 1994).
	679,273	Total number of workers
	4,518	Number of workers using transit to work.
	60.00%	Workers have to loose jobs or can only get minimal-wage jobs without transit.
$	20,331	Average wage of rural workers (1994 dollars) [County and City Data Book, 1994.]
$	14,994	Average wage for workers using transit (1994 dollars, from 1990 NPTS, South Atlantic region).
$	40,643,759	Total annual economic benefit (Assume one worker per household).
	72.07%	Percent of per capital retail and service employees over the state average.
	1.88	Multiplier factor.
$	54,938,111	Adjusted total economic benefit from work trips.

Step 4: Estimate Revenue Benefits of Transit Work Trips

Table 8 shows the approach to estimate the revenue benefits of transit work trips.

- Estimate local tax revenues and State rebates for County. Estimate total State or personal income.
- Divide to obtain percentage local tax revenues as percentage of personal income.
- Using total annual economic benefit for work trips from Step 3, multiply by percentage local tax revenue to obtain fiscal revenue benefits from transit work trips.

Table 8: Revenue Benefits of Transit Work Trips

$ 1,325,143,009	Own-source revenues (1994 dollars) [County and City Data Book 1994.]
$ 25,366,460,899	Total personal income (1994 dollars) [County and City Data Book 1994.]
5.22%	Percent of own-source revenues to personal income.
$ 40,643,759	Total annual economic benefit.
$ 2,123,228	Fiscal revenue benefits from transit work trips.

Step 5: Estimate Total Economic Benefit/Cost and Fiscal Revenue/Cost Ratios

Tables 9 and 10 show how one can calculate the total economic benefit to cost ratio and the fiscal revenue to cost analysis.

- Obtain total fare revenue for rural transit.
- Obtain total federal rural transit subsidy and total local operating subsidy.
- Estimate annualized vehicle depreciation fixed costs.
- Add economic benefits from elderly and worker trips and divide by costs to obtain benefit/cost ratio with and without federal subsidy. Add local net revenue benefits fro elderly and worker tirps and divide by costs to obtain fiscal revenue/cost ratio with and without subsidy.

Table 9: Total Economic Benefit/Cost Analysis

$ 735,651	Total fare revenue (1994 Georgia DOT figures for all rural counties)
$ 1,671,059	Total federal subsidy (Georgia DOT figures, 1994)
$ 1,263,620	Total local operating subsidy (Georgia DOT figures, 1994)
$ 950,000	Fixed Costs -- Annualized Vehicle Depreciation
$ 111,366,902	Local net economic benefits (losses) with federal transit subsidy.
50.31	Local economic benefit/cost ratio of transit subsidy (with federal subsidy).
$ 108,024,784	Local net economic benefits (losses) without federal transit subsidy.
27.81	Local economic benefit/cost ratio of transit subsidy (without federal subsidy).

Table 10: Total Fiscal Revenue/Cost Analysis

$ 735,651	Total fare revenue (1994 Georgia DOT figures for all rural counties)
$ 1,671,059	Total federal subsidy (Georgia DOT figures, 1994)
$ 1,263,620	Total local subsidy (Georgia DOT figures, 1994)
$ 950,000	Fixed Costs -- Annualized Vehicle Depreciation
$ 4,697,745	Local net revenue benefits (losses) with federal transit subsidy.
2.12	Local revenue benefit/cost ratio of transit subsidy (with federal subsidy).
$ 1,355,627	Local net revenue benefits (losses) without federal transit subsidy.
0.35	Local revenue benefit/cost ratio of transit subsidy (without federal subsidy).

The results of this analysis are shown in Table 11 (the same as Table 2 and in Tables 12 and 13 for each of the targeted counties in this study. Tables 12 and 13 are the results when using the default values described earlier. Local values for the input data would obviously change the benefit/cost ratio for that county.

6.0 CONCLUSIONS

This study has estimated two important impacts of rural transit service in Georgia from the standpoint of local (county) government: the overall economic impacts and the fiscal revenue impacts. The economic impacts of rural transit service is large and positive. It indicates rural transit service is a significant means to retain the vitality of rural area economic development.

The overall fiscal revenue impact of rural transit service depends on the availability and amount of federal subsidies and the tax rate of local governments. It is positive and is larger than 1.0 for the rural counties of the state of Georgia, given the current level of federal transit subsidy and the current level of county tax and user charges. It shows that, in addition to provide mobility and accessibility to transportation disadvantages, rural transit services also promote economic development, and bring positive fiscal revenues for local governments. However, without federal transit subsidy, the revenue impact becomes smaller, the benefit/cost ratio would become less than 1.0 for the rural parts of the state as a whole. Furthermore, the changes in the county tax rate will also change the fiscal revenue impact.

It should be noted, however, that some other economic and non-economic benefits resulting from transit service are not quantified in this study. For example, non-work trips such as shopping, medical and/or recreational trips taken by non-elderly transit dependents will generate

Table 11: Benefits/Costs for Rural Transit With Federal Subsidy

	ECONOMIC IMPACTS		REVENUE IMPACTS	
County Name	Net Gain (loss)	B/C ratio	Net Gain (loss)	B/C ratio
Banks, GA	$ 198,585	15.66	$ 14,176	1.13
Bartow, GA	$ 3,112,529	42.59	$ 130,971	1.79
Blackley, GA	$ 308,310	7.51	$ 24,018	0.59
Bryan, GA	$ 377,259	6.96	$ 13,315	0.25
Burke, GA	$ 493,712	9.56	$ 393,059	7.61
Catoosa, GA	$ 718,677	11.14	$ 99,502	1.54
Chattahoochee, GA	$ 20,806	0.75	$ 394	0.01
Cherokee, GA	$ 2,223,615	37.91	$ 98,045	1.67
Clay, GA	$ 72,162	2.07	$ 13,516	0.39
Columbia, GA	$ 1,878,887	67.95	$ 57,119	2.07
Crawford, GA	$ 119,495	3.51	$ 17,418	0.51
Dade, GA	$ 238,808	13.19	$ 16,036	0.89
Dodge, GA	$ 1,430,015	29.27	$ 79,883	1.64
Douglas, GA	$ 3,911,616	47.33	$ 115,984	1.40
Elbert, GA	$ 732,662	14.37	$ 34,822	0.68
Emanuel, GA	$ 840,310	27.80	$ 57,209	2.48
Fannin, GA	$ 743,736	14.87	$ 41,330	0.83
Forsyth, GA	$ 1,564,074	42.80	$ 55,651	1.52
Gilmer, GA	$ 625,998	16.60	$ 29,072	0.77
Glascock, GA	$ 24,711	1.06	$ 4,985	0.21
Gordon, GA	$ 1,297,534	34.97	$ 68,039	1.70
Greene, GA	$ 447,711	7.98	$ 44,228	0.78
Habersham, GA	$ 1,201,852	38.88	$ 80,585	2.61
Hall, GA	$ 7,394,784	67.45	$ 343,445	3.13
Hancock, GA	$ 242,772	6.69	$ 40,072	1.10
Haralson, GA	$ 744,544	16.61	$ 53,035	1.18
Hart, GA	$ 558,520	24.45	$ 35,245	1.54
Henry, GA	$ 2,254,468	55.49	$ 167,336	4.12
Jackson, GA	$ 730,868	22.84	$ 65,758	2.05
Jefferson, GA	$ 571,783	9.96	$ 46,291	0.81
Jenkins, GA	$ 104,736	4.67	$ 14,983	0.67
Laurens, GA	$ 4,614,282	128.60	$ 249,237	6.95
Lincoln, GA	$ 110,829	5.57	$ 13,028	0.65
Long, GA	$ 8,649	0.26	$ 8,737	0.26
Lumpkin, GA	$ 234,440	11.39	$ 11,702	0.57
McDuffie, GA	$ 822,430	17.45	$ 46,402	0.98
Montgomery, GA	$ 225,085	8.75	$ 10,116	0.39
Morgan, GA	$ 520,597	12.51	$ 26,944	0.65
Murray, GA	$ 152,229	3.28	$ 30,458	0.66
Paulding, GA	$ 512,466	13.68	$ 66,678	1.68
Peach, GA	$ 788,869	22.29	$ 63,674	1.80
Pickens, GA	$ 383,092	8.96	$ 31,635	0.78
Pierce, GA	$ 268,299	11.26	$ 20,251	0.86
Pulaski, GA	$ 269,625	19.31	$ 16,983	1.21
Putnam, GA	$ 208,678	5.19	$ 42,381	1.05
Quitman, GA	$ 21,135	1.52	$ 5,241	0.38
Rabun, GA	$ 640,111	51.80	$ 29,136	2.36
Talbot, GA	$ 46,418	0.91	$ 14,996	0.29
Taliaferro, GA	$ 30,125	1.16	$ 5,572	0.21
Telfair, GA	$ 659,816	26.81	$ 37,787	1.53
Tift, GA	$ 3,919,660	104.46	$ 241,957	6.45
Treutlen, GA	$ 82,689	6.33	$ 9,563	0.73
Troup, GA	$ 10,230,904	214.41	$ 476,695	9.99
Twiggs, GA	$ 78,207	5.94	$ 16,413	1.25
Walker, GA	$ 1,650,559	31.07	$ 59,315	1.12
Warren, GA	$ 299,935	11.84	$ 39,179	1.55
Wheeler, GA	$ 100,734	7.66	$ 17,041	1.30
Whitfield, GA	$ 5,162,593	48.04	$ 308,077	2.85
Wilcox, GA	$ 369,380	14.89	$ 19,453	0.78
Wilkes, GA	$ 648,517	18.75	$ 49,321	1.43
Wilkinson, GA	$ 172,103	13.07	$ 24,645	1.67
All Rural Counties	$ 111,366,902	50.31	$ 4,697,745	2.12

Table 12: Benefits/Costs Without Federal Subsidy

County Name	ECONOMIC IMPACTS		REVENUE IMPACTS	
	Net Gain (loss)	B/C ratio	Net Gain (loss)	B/C ratio
Banks, GA	$ 177,215	7.97	$ (5,194)	(0.23)
Bartow, GA	$ 3,008,834	24.06	$ 27,079	0.22
Bleckley, GA	$ 248,186	3.49	$ (36,106)	(0.51)
Bryan, GA	$ 309,507	3.51	$ (54,437)	(0.62)
Burke, GA	$ 418,072	4.67	$ 317,419	3.55
Catoosa, GA	$ 630,857	5.62	$ 11,682	0.11
Chattahoochee, GA	$ (2,144)	(0.05)	$ (22,558)	(0.58)
Cherokee, GA	$ 2,126,915	19.88	$ 1,345	0.01
Clay, GA	$ 17,458	0.28	$ (41,188)	(0.66)
Columbia, GA	$ 1,828,387	34.83	$ 6,819	0.13
Crawford, GA	$ 69,219	1.17	$ (32,858)	(0.56)
Dade, GA	$ 214,088	7.02	$ (8,702)	(0.29)
Dodge, GA	$ 1,345,245	14.74	$ (4,867)	(0.05)
Douglas, GA	$ 3,816,416	29.30	$ 20,784	0.16
Elbert, GA	$ 649,082	8.99	$ (48,678)	(0.52)
Emanuel, GA	$ 604,050	14.68	$ 20,949	0.51
Fannin, GA	$ 659,736	7.17	$ (42,670)	(0.48)
Forsyth, GA	$ 1,504,830	22.74	$ (3,583)	(0.05)
Gilmer, GA	$ 562,458	8.10	$ (34,468)	(0.50)
Glascock, GA	$ (9,101)	(0.23)	$ (28,827)	(0.72)
Gordon, GA	$ 1,235,334	18.11	$ 839	0.01
Greene, GA	$ 361,877	3.65	$ (41,806)	(0.42)
Habersham, GA	$ 1,155,152	21.33	$ 34,085	0.63
Hall, GA	$ 7,214,008	36.08	$ 162,659	0.81
Hancock, GA	$ 183,822	2.80	$ (18,878)	(0.29)
Haralson, GA	$ 674,904	8.47	$ (16,605)	(0.21)
Hart, GA	$ 529,410	14.16	$ 6,135	0.16
Henry, GA	$ 2,185,920	29.18	$ 98,788	1.32
Jackson, GA	$ 677,218	11.51	$ 12,088	0.21
Jefferson, GA	$ 487,363	4.89	$ (38,129)	(0.38)
Jenkins, GA	$ 72,596	1.89	$ (17,177)	(0.45)
Laurens, GA	$ 4,557,162	70.72	$ 192,117	2.98
Lincoln, GA	$ 82,699	2.44	$ (15,102)	(0.44)
Long, GA	$ (33,589)	(0.62)	$ (33,601)	(0.61)
Lumpkin, GA	$ 203,920	5.69	$ (18,818)	(0.53)
McDuffie, GA	$ 749,810	8.99	$ (26,216)	(0.31)
Montgomery, GA	$ 182,959	3.91	$ (32,010)	(0.68)
Morgan, GA	$ 464,567	6.67	$ (29,068)	(0.42)
Murray, GA	$ 74,729	0.88	$ (47,042)	(0.55)
Paulding, GA	$ 454,126	6.81	$ 11,538	0.17
Peach, GA	$ 730,503	11.31	$ 5,288	0.08
Pickens, GA	$ 289,152	3.73	$ (42,305)	(0.55)
Pierce, GA	$ 227,664	5.30	$ (16,383)	(0.43)
Pulaski, GA	$ 243,955	9.10	$ (8,707)	(0.32)
Putnam, GA	$ 137,824	1.82	$ (28,493)	(0.38)
Quitman, GA	$ (43)	(0.00)	$ (15,937)	(0.65)
Rabun, GA	$ 623,513	30.19	$ 12,536	0.61
Talbot, GA	$ (31,660)	(0.35)	$ (63,082)	(0.70)
Taliaferro, GA	$ (8,651)	(0.19)	$ (33,204)	(0.73)
Telfair, GA	$ 620,114	13.95	$ (1,935)	(0.04)
Tift, GA	$ 3,867,932	61.02	$ 190,229	3.00
Treutlen, GA	$ 58,685	2.34	$ (14,421)	(0.58)
Troup, GA	$ 10,149,130	114.55	$ 394,921	4.46
Twiggs, GA	$ 53,879	2.13	$ (7,915)	(0.31)
Walker, GA	$ 1,588,339	18.85	$ (2,905)	(0.03)
Warren, GA	$ 255,715	5.39	$ (5,041)	(0.11)
Wheeler, GA	$ 76,874	3.07	$ (6,819)	(0.27)
Whitfield, GA	$ 5,034,593	29.36	$ 178,077	1.04
Wilcox, GA	$ 329,274	7.34	$ (20,833)	(0.46)
Wilkes, GA	$ 592,657	9.48	$ (6,539)	(0.10)
Wilkinson, GA	$ 147,751	5.83	$ 293	0.01
Rural Counties	$ 108,024,784	27.91	$ 1,355,627	0.35

benefits for transit users and economic benefits for the local economy, but they are not quantified in this study for the lack of data. The non-economic benefits include environmental benefits, benefits of reducing auto dependence, parking requirement impacts, land use impacts, and so on, are not quantified either. Furthermore, the benefits and costs to individual commuters, including the economic, social and human benefits of providing rural residents accessibility and mobility, travel time costs and monetary costs, are not dealt with in this study either. Further study needs to address those benefits and costs more thoroughly.

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APPENDIX A

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Notations:

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APPENDIX B

State DOT Information

Alabama Department of Transportation (main number 205-242-6356)

6/23/94 Spoke with engineer -- no knowledge of any economic impact type studies

California Department of Transportation (main number 916-654-2852)

7/25/94 Spoke with Lupe Rios (916-654-8065; FAX 916-654-9366) of the Division of Mass Transit (916-654-8811); received a copy of their Transit Development Act (TDA) which provides some information. In addition, he contacted Josh Shaw (916-446-4656), a legislative lobbyist with the California Transit Association (CTA) who is sending a copy of a study that his organization and CalTrans jointly sponsored (Received).

Florida Department of Transportation (main number 904-488-8541)

6/23/94 Spoke with Rob McGee, RTAP coordinator (904-488-7774). Their studies to date only look at the social impacts of transportation services; no economic impact studies have been performed. There are no rural transit agencies in Florida, only the Transportation Disadvantaged Commission. He suggested contacting CTR at the University of South Florida -- Rosemary Mathias (813-974-3120). After calling several times and leaving several messages, gave up on this lead.

Illinois Department of Transportation (main number 217-782-7820)

Spoke with Vicki in the Planning Branch (217-782-7868), who was not aware of any research or methodology in the area of economic impacts of rural transit.

Iowa Department of Transportation (main number 515-239-1101)

Spoke with Tom Jackson in the Project Planning Group. Iowa has not attempted to look at the economic impacts of transit. However, they have conducted some research on the economic impacts of highway investments, using an input-output model developed by REMI (Regional Economic Models, Inc.) of Amherst, MA. He will send information on REMI (received).

Kansas Department of Transportation (main number 913-296-3566)

Spoke with Mokhtee Ahmad of the Bureau of Transportation Planning (913-296-3228) on 8/30/94. He said that transit economic impacts have not been looked at by the Kansas DOT. Kansas State University will be looking at this in the future. However, the Kansas DOT has looked at the impacts of transportation investments in general, using a methodology called ROPI (Return On Public Investments) developed at Kansas State University.

Spoke with David Burress of the Economics Department at Kansas State University (913-864-3701), who is familiar with the ROPI methodology. He is sending information on the ROPI methodology.

Louisiana Department of Transportation (main number 504-379-1100)

6/23/94 Spoke with Shirley Lee in Public Transportation Department -- no economic impact studies sponsored by them.

6/27/94 Spoke with Coan Bueche (504-358-9131) in the Planning Department -- they are putting together an intermodal plan through a USDOT grant, but have no current economic impact studies. Louisiana is not far progressed in this area.

Michigan Department of Transportation (main number 517-373-2090)

Spoke to the director of UPTRAN (517-373-2835), who had no information or research on economic impacts.

Spoke with Bill Hartwig, Administrator of Project Planning and Development (517-373-2316), who also had no information. He suggested I call Mike Mobey of the Isabella County Transit Commission (517-773-2410); he was out for a month, but I was told to contact Dr. Larry Syke at Central Michigan Univ. (517-774-4000), who was doing a study for the Commission. His study, however, regarded only cost information and social impacts of transit.

Minnesota Department of Transportation (main number 612-296-3000)

Made numerous attempts to contact Judy Ellison in the Transit Branch (612-296-3379), to no avail.

Mississippi Department of Transportation (main number 601-359-1209)

Spoke with Charles Carr, Director of Transit Division (601-359-6617) -- They have no economic impact methodology or studies relating to one, but are beginning to look into it. They are interested in keeping in touch and hearing the results of our work.

Spoke with Lowell Livingston of Intermodal Planning (601-944-9142) -- they have no information to help us.

Nebraska Department of Roads (main number 402-479-4775)

Spoke with Larry Brown of the Department of Transportation Planning (402-479-4519). Nebraska has conducted a study on the impacts of railroad track abandonment. However, he had no information or studies on the economic impacts of transportation investments.

New York Department of Transportation (main number 518-457-6195)

Spoke with Ron Tweedy of the Planning Division (518-457-1966) and Clarence Fostdick of Statewide Planning (518-457-7055), who had John Engstrom of Statewide Planning call me back -- he is not aware of any research or methodology for economic impact assessment.

Spoke with Jim Davis in the Public Transportation Division -- he said that all of the NY DOT information on economic impacts of transit investments focuses on urban areas, in particular the New York metro area. He suggested contacting the Community Transportation Association of America (already contacted) and the FTA.

North Carolina Department of Transportation

Spoke with a representative of the Public Transportation Division, who said that North Carolina had no research or methodology established in the area of economic impacts of rural transit.

Also contacted Anna Nalevanko at the North Carolina Institute for Transportation Research and Education, who also had no information in the area in question.

Contacted David Hartgen at the University of North Carolina at Charlotte Department of Geography (704-547-4308), who made many suggestions for sources for literature in the economic impacts area, several of which were researched in the literature review process. He did not himself have any research directly relating to the topic in question. In addition, he made extensive suggestions regarding the "best" way to proceed on the research as a whole, which are mentioned in the summary.

Ohio Department of Transportation (main number 614-466-7170)

Made numerous attempts to contact both the Planning (614-466-2307) and Public Transportation (614-466-8969) Units, to no avail.

Oklahoma Department of Transportation (main number 405-521-2579)

Spoke with someone in the Planning Division (405-521-2704). They do only level of service analysis for highway planning.

Spoke with Ken Larue (405-521-2584) of the Transit Planning Branch -- he recalled some research in the area of economic impacts being conducted some years ago by Dr. Gerald Doeksin (405-744-6081), an extension economist at Oklahoma State University. Spoke with Dr. Doeksin, who will send information on his research in this area (received).

Oregon Department of Transportation (main number 503-986-4000)

Attempted to reach Lee Lafontaine in the Policy and Strategic Planning Unit (503-986-3466), but unable to contact.

Spoke with someone in the Public Transit Unit (503-986-3300) on 7/25/94. They are not familiar with any economic impact research or methodology in use.

Pennsylvania Department of Transportation (main number 717-787-3028)

Spoke with Jim Greer, Division Chief for the Public Transit Division (717-787-3921) on 7/25/94. The urban areas in Pennsylvania have done some research in the area of economic impacts of transit. John Bockendorf (717-787-7540) will send report put out by the State Transit Association (industry group including SEPTA, PAT, et al) on economic impacts of transit in Pennsylvania (received).

Spoke with Bob Janecko (717-787-2862) on 7/25/94, director of the Center for Program Development and Management, who noted that Pennsylvania uses an input-output model (TRIP) to estimate impacts of highway investments, but it only looks at the direct and indirect *construction related* impacts of the work.

South Carolina Department of Transportation (main number 803-737-1130)

Spoke with someone in the planning branch of the SCDOT -- they have no research or methodology in this area. No one available in the Mass Transit Branch.

Tennessee Department of Transportation (main number 615-741-7900)

Made numerous attempts to reach Michael Pressley, research coordinator for the Planning Division (615-741-5025), to no avail.

Washington Department of Transportation (main number 206-705-7000)

Spoke with Eric Meale of the Economics Office of the Planning Division (206-705-7962). Washington looks at economic impacts in general terms, including the costs of congestion. They use the amount people pay for their transportation as a descriptor of the value of that transportation (as a minimum value).

Tried to reach Valerie Rodman in the Public Transportation Division (206-705-7921), Who had Kim Doyle (206-705-7928) contact me directly. Ms. Doyle has also been seeking a methodology to quantify the economic impacts of rural transit. In particular she would like to be able to measure and/or predict the gross receipts in retail in small towns outside the hub of larger towns resulting from the provision of transit services.

Ms. Doyle has encountered concern from small-town retailers that transit services might lead to potential customers using the transit service to obtain goods and services in nearby larger communities, thus hurting the local retail economy. She counters such arguments with the suggestion that increased overall mobility should lead to increased overall consumerism, thus increasing business for all. She suggested that the methodology developed might look at the direct and indirect jobs produced as a result of the introduction of rural transit services. Ms. Doyle is obviously interested in obtaining the results of this research.

Wisconsin Department of Transportation

Spoke with George Gunerson of the Planning and Budget Division (608-266-1402), who mentioned the Hwy. 29 corridor study -- he will send a copy of the complete report (received). He also mentioned a report done for the east-west corridor light rail feasibility for Milwaukee. Spoke with Jim Beckwith of Wisconsin DOT in Milwaukee (414-548-8675), who will send a copy of this report and related documentation (received).

Other Agency Information

US Department of Transportation Norm Paulhus (202-366-4997)

He noted that Penn State has a clearinghouse for University Transportation Research Centers. He suggested searching UMTRIS, available from TRB (at a small cost) for information on the topic. This database is available on-line through DIALOG (available at Georgia Tech Library). Marina Drancsak of FTA (202-366-0201) can help if needed. *A TRIS search was later conducted at Georgia Tech, and the results included in the literature review.*

He also suggested a publication on transit benefit estimation by Ed Beinborn of the Univ. of Wisconsin @ Milwaukee (414-229-4978). Meyer has this publication.

Community Transportation Association of America (CTAA)

Spoke with Dennis Day -- he is sending studies on the subject area (received). He suggested speaking with Eillen Stonnes of the Dept. of Agriculture (202-690-1305) regarding this topic.

US Department of Agriculture, Marketing and Transportation Research

Stonnes not available: Spoke with Roy Smoley in marketing research (202-720-8042), who is doing work on ISTEA's impact on rural areas. Also spoke with Martha Bear, who is sending information on various research projects she thinks might be of interest (received).